**In the Specification**

Replace Table 1 on page 2 with the following:

TABLE 1

| | | | | |
|---|---|---|---|---|
| $S = E \times H$ | where | S | = | Power per unit area (W/m^2)-Poynting Vector |
| | | E | = | Electric Field Intensity Vector |
| | | H | = | Magnetic Field Intensity Vector |

and

| | | | | |
|---|---|---|---|---|
| $V \times H = J + \partial D/\partial t$; | where | V | = | Direction of the axis of rotation and the magnitude of the rotation Vector |
| | | H | = | Magnetic Field Intensity Vector |
| | | J | = | Current Density Vector |
| | | D | = | Magnetic Flux Density |
| | | $\partial/\partial t$ | = | time derivative |

On page 3 (bridging to page 4), replace the fourth paragraph, beginning at line 25, with the following:

--Directivity is a measure of the reflected and incident field differentiation of a coupler. The algebraic difference in decibels (dB) of the forward and reverse coupling coefficients for any fixed structure is defined as the directivity of that structure. A 20dB directivity factor is considered acceptable for a bi-directional coupler. Historically, high performance bi-directional couplers have been fabricated on a substrate such as alumina, with thin film processes and their tight tolerance capability defining the coupler geometries to achieve a controlled [[20 dB]] 20dB coupling coefficient with greater than 20dB of directivity. Although the modularized approach to implementing the coupler is effective, it adds cost and process steps that could otherwise be eliminated if the coupler were to be embedded into the printed circuit board (PCB) [[itself]]. To achieve high reliability coupler performance with existing PCB make tolerances of ±2mil

gaussian width distributions requires an innovative design approach. This innovation is based on selecting the proper coupling mode (E-field or H-field) that provides a design meeting manufacturing and performance requirements, while minimizing cost and area. Therefore, the need exists for embedded PCB coupler structure which achieves these desired objectives.--

On page 5, replace the fourth paragraph, beginning at line 11, with the following:

--4) Ensure that overall current flow induced onto the coupling structure is not "folded back" onto itself by utilizing structures that have 180° discontinuities within the same plane.--

On page 5, replace the third bulleted paragraph, beginning at line 28, with the following:

- Series lumped element capacitor to achieve band pass resonant response; also ~~serves as a dc block (from rectifying diode)~~ serving to block direct current (DC) from the rectifying diode.

On page 6, replace the second paragraph, beginning at line 10, with the following:

--Transmission line 301 is generally attached to an RF source such as an RF power amplifier (not shown) and provides for efficient propagation of RF energy within a specific frequency range to subsequent stages such as harmonic filters (also not shown). As RF power is transmitted down the main transmission line, EM near-fields are generated which are coupled to adjacent structures 300 and 302. The physical dimension of the transmission line 301 is determined through classical methods dependent on substrate dielectric constants, desired

characteristic impedance, and distance from ground planes (not shown). The physical dimensions of upper and lower coupling plates 300 and 302 are set to minimize capacitive (E-field) coupling ; thus overlap with either the main transmission line or with subsequent interconnected plates are minimized. This means that the coupling plated are generally thin with respect to the transmission line (high impedance) and designed to maximize surface area parallel to the main transmission line (perpendicular to the H-field) through using secondary appendages or geometric structures. The number of turns of the helix structure is set by the coupling factor and frequency of operation required for the given application. The greater the number of turns for a given frequency, the ~~greater~~ higher the coupling factor. The higher the frequency of operation, the lower the number of turns required for a given coupling factor.--

On page 7, replace the first full paragraph, beginning at line 3, with the following:

--As illustrated in FIG. 3, a series of vias 303 are employed to interconnect the upper and lower plates 300 and 302 to provide electrical connectivity to the entire helix coupling structure. The distance from the vias to the edge of the main transmission line is determined by the plane of intersection between the H-field and the helix structure. Although this relationship will be explored in further detail herein, it should be noted that in some <u>alternative embodiment</u> geometries, the via connection 303 ~~themselves~~ can be considered [[as]] perpendicular "flanges" in the Z-plane to the H-field vectors in the XY-plane (vias 303 perpendicular to [[H-Field]] <u>H-field</u> of transmission line 301). This will be explored further in subsequent descriptions.--

On page 7, replace the third paragraph, beginning at line 19, with the following:

--Referring to FIG. 4, the interrelationship between the helix structure, secondary flanges, and main transmission line 401 can be clearly seen. This top view of FIG. 3 shows that the horizontal separation 408 between the flange edge and the transmission line 401 is minimal without overlapping each other. The distance 404 from the transmission line edge to vias 403 is

significantly larger than flange separation 408. And since near field coupling efficiency is inversely proportional to the distance between the source (transmission line 401) and receptor, the flanges embedded into the upper and lower plates 400 and 402 are the primary coupling structure over the vias. ~~The length of the flange segments~~ <u>The flange segment lengths</u> 405, 406, and 407 are determined by geometric spacing of the interconnecting vias 409 and the frequency of operation.--

On page 8, replace the first full paragraph, beginning at line 9, with the following:

--Referring to FIG. 5, a second or alternative embodiment of the invention is disclosed. Here, no parallel structures are evident in the XY plane between transmission line 501 and upper [[an]] <u>and</u> lower plate structures 500 and 502. However, the transmission line 501 is offset to one side to provide close proximity to the family of vias 504. Distance 505 is significantly smaller than distance 504 (proximity to family of vias 506). Thus the H-field radiation in the XY plane is perpendicularly bisected by vias 503 in the Z-plane. Distance 505 is set by PCB manufacturing tolerances and the desired level of coupling efficiency required for the given application. The geometry in FIG. 5 has a further advantage of minimizing capacitive coupling by minimizing the overlap surface area between coupling plates 500 and 502 and transmission line 501. The distance <u>509</u> between each via [[509]] is determined by the desired arch-length of the interconnecting coupling plates 500 and 502, and the desired coupling coefficient. The greater the number of vias per unit length of transmission line 501, the higher the coupling factor.--

On page 9, replace the second paragraph, beginning at line 13, with the following:

--As in the previous embodiments, the distance <u>609</u> between vias [[609]] is determined by manufacturing tolerances, desired coupling efficiency, and frequency of operation (which sets the number of turns in the helix). The width of transmission line 601 is determined using

classical stripline or transmission line calculations dependent on substrate dielectric constant, desired characteristic impedance, and distance to nearest ground planes. The substrate geometry is equivalent to the previously discussed embodiments and is illustrated in FIG. 7. The length 604, 605 and 606 of each parallel segment embedded within the upper and lower plates 600 and 602 is set by via separation 609 and angle of intersection 607. It should be apparent to those skilled in the art that variations of the plate geometry can be achieved that changing the relative angle of 607 so that the lengths 604, 605 and 606 are varied, while still maintaining the integrity of the proposed embodiment.--

On page 9 (bridging to page 10), replace the third paragraph, beginning at line 25, with the following:

--Another possible embodiment of this invention is applicable to non-planar structures. Referring to FIG. 8, a transmission line or wire 801 is suspended in a dielectric such as air. A semi-rigid, continuous helix structure 800 is wrapped around transmission line 801 to support secondary coupling element 802. These coupling elements are parallel to the transmission line and may be of varying lengths 804, varying quantity, or separation 803, depending on the application, frequency of operation, or desired performance. The coupling elements 802 are connected together through helix structure 800, which is electrically conducting. Termination elements such as ~~capacitor 805~~ capacitor 806 and ~~resistor 806~~ resistor 805 are ~~position~~ positioned at the terminals of the helix to provide directional differentiation of the RF energy traveling along transmission line 801. This is similar to the techniques described in the previous embodiments.--